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EXAMINER	
LAROSE, COLIN M	
ART UNIT	**PAPER NUMBER**
2623	

DATE MAILED: 07/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/987,918	STEVENS ET AL.	
	Examiner	Art Unit	
	Colin M. LaRose	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,14,15,17 and 19* is/are rejected.

7)☒ Claim(s) *12,13,16,18 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Arguments and Amendments

1. Applicant's amendments and arguments filed 28 February 2005, have been entered and made of record.

Drawings

2. The corrected figures 1A and 1B have been received. These drawings are accepted.

Claim Objections

3. In view of Applicant's amendments to claims 17 and 18, the previous claim objections have been withdrawn.

Response to Arguments

4. Applicant's arguments with respect to claim 1 have been fully considered but are not persuasive for the following reasons.

Applicant presents three arguments regarding the rejection of claim 1:

5. First, Applicant argues that Krishnamachari does not disclose obtaining first and second 2-D images of an object. Applicant asserts that Krishnamachari's image retrieval system "does not teach, describe or suggest that target image 101 and any of the images 111 (in the retrieval database) are of the same object" (see Applicant's Remarks, pp. 12-13).

It is true that Krishnamachari does not expressly disclose that any of the database images are of the same object as the target image. However, the converse is true in that Krishnamachari

does not disclose that all the images in the database are not of the same object as the target image. The purpose of Krishnamachari's system is to retrieve images from a database that are most similar to a target image.

For example, Krishnamachari's system is operative to store a database of images of paintings; the user then provides a target image of a painting. The target image may be an unknown painting, and the user wishes identify it; or the user may be familiar with the painting and wants to know whether an image of the painting is in the database. Krishnamachari's system then compares a color histogram of the target image to a color histogram of each of the images in the database. The system then retrieves the images in the database that are most similar to the target image based on the comparison.

Krishnamachari does not expressly state that the target image is of the same object as any of the database images. However, such a limitation is so easily inferred as to be implicit in Krishnamachari's disclosure. In the above example, the target image and a database image may very well be of the same object (i.e. painting). If that is the case, then the system will report that the target image and the database image of the same painting are substantially similar. On the other hand, if the painting in the target image is not found in any of the database images, then the system may not find any of the images in the database to be similar; however, there may be other images of paintings in the database that use similar colors or that are by the same artist so that the system does find a database image(s) to be similar, although not identical, to the target image. Such is the operation of Krishnamachari's system – it does not require that any of the database images are of the same object as the target image, but this limitation would have been

implicit to those skilled in the art, since the purpose of Krishnamachari's retrieval system is to identify any database image(s) that match a provided target image.

6. Second, Applicant argues that Krishnamachari does not disclose processing a region, since Krishnamachari's disclosure is directed to processing entire images (see Applicant's Remarks, pp. 14-15). As stated in the previous Office action, Krishnamachari is not considered to teach this feature. Therefore, the Moghaddam reference was relied upon to provide motivation for processing regions of interest (ROIs) in an image rather than entire images.

7. Third, Applicant argues that one skilled in the art would not have been motivated to combine the teachings of Krishnamachari and Moghaddam to achieve the claimed invention (see Applicant's Remarks, pp. 15-17). Examiner maintains that there is sufficient motivation to combine the teachings of the two references. Both are related to content-based image retrieval, and more specifically, both are related to content-based image retrieval involving the comparison of color histograms between images in a database and a target image.

Applicant asserts that, in contrast to Krishnamachari and Moghaddam, "the present invention is used for determining color consistency of regions of images of the same object for use in 3-D modeling" (p.15). Examiner appreciates the differences between the disclosed invention and the teachings of Krishnamachari and Moghaddam. However, in the Examiner's opinion, the claimed invention is an obvious combination of the prior art image query and retrieval systems taught by Krishnamachari and Moghaddam. That is, the invention, as claimed in claim 1, does not differentiate a method of measuring color consistency for image retrieval from a method of measuring color consistency for 3-D modeling. The claim calls for comparing the histograms of an object region in two images of the same object, and then processing the

region based whether the histograms are similar. In the claim, there are no details regarding how the image is "processed" that would differentiate the claim as a method involving 3-D modeling from a method involving image retrieval.

The above remarks regarding claim 1 also apply to the corresponding computer program product of claim 19.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-3, 5-11, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,721,449 by Krishnamachari in view of "Image Retrieval with Local and Spatial Queries" by Moghaddam et al. ("Moghaddam").

Regarding claims 1 and 19, Krishnamachari discloses a method of measuring color consistency comprising:

obtaining a first 2-D image and a second 2-D image of an object (figure 1: a target image and a reference image of an object from a database are obtained);

subdividing the first image into a first set of partitions and the second image into a second set of image partitions, each partition having a color (i.e. each of the first and second images are partitioned into pixels ("partitions"), each pixel having a color);

selecting a first subset of image partitions in the first set of image partitions (e.g. a first image block as one of 4x4, 8x8, or 16x16 image blocks is a first subset of pixels in the target image) and a second subset of image partitions in the second set of image partitions (e.g. a second image block as one of 4x4, 8x8, or 16x16 image blocks is a second subset of pixels in the reference image) (see column 4, line 59 through column 5, line 13);

assigning each image partition in the first subset and each image partition in the second subset a color value corresponding to the color of the image partition (column 4, lines 33-58: pixels in each block are assigned CIELAB or CIELUV color values based on their respective colors);

placing each image partition in the first subset in one of a first series of histogram subdivisions and each image partition in the second subset in one of a second series of histogram subdivisions based on the color value of each image partition (column 5, lines 14-34: for each of the first and second image blocks, an histogram is generated whereby pixels in each block are accumulated into histogram subdivisions based on color values of the pixels);

comparing the first series of histogram subdivisions to the second series of histogram subdivisions (column 5, lines 25-34: the histograms of corresponding image blocks in the target and reference images are compared based on the "proportion of occurrences" of the colors therein, thereby effecting a comparison of the histogram bins ("subdivisions") for corresponding blocks in each of the two images);

processing the second image based on whether the first series of histogram subdivisions and the second series of histogram subdivisions have a similarity (column 6, lines 19-29: if the first and second series of histograms subdivisions are similar (as well as other corresponding

series pairs), then the reference image is identified as being similar to the target image, and is processed so that it is displayed in a list of similar images).

Krishnamachari is silent to selecting the blocks ("subsets") of pixels ("image partitions") "based upon criteria related to a 3-D region of the object" and processing "the region" based on whether the pair of series of histogram subdivisions is similar.

Moghaddam discloses a content-based image retrieval system, similar to that of Krishnamachari, in which database images that are substantially similar to a target image are retrieved. Moghaddam, like Krishnamachari, utilizes local color histograms in order to effect a comparison between a target and a reference image.

Moghaddam also discloses the feature of allowing a user to specify regions of interest which serve as search criteria and lead to "a more powerful search engine." See § 1. As shown in figure 1, a user can select region(s) of interest corresponding to three-dimensional objects in a scene. Those regions of interest are then processed using local histogram measures, as shown in figure 2. The histograms of those regions are then matched to histograms of the reference images in order to find a sufficiently matching image.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari by Moghaddam to select the subsets of image partitions "based upon criteria related to a 3-D region of the object" and process "the region" based on whether the pair of series of histogram subdivisions is similar since Moghaddam discloses that selecting subsets of image partitions in a target image based on a region of a 3-D object according to a user's preference and then processing (e.g. retrieving and displaying) the region based on the similarity between histogram subdivisions of the target and reference images produces "a more powerful

search engine"; a user is allowed to specify arbitrary regions of objects to be retrieved rather than relying on a computer to specify the regions (see Abstract and § 1).

Regarding claim 2, Krishnamachari discloses that the obtaining step comprises obtaining images of a scene as the object (figure 1: "target image" and reference image(s) in the "image database" are images of scenes).

Regarding claim 3, Krishnamachari discloses subdividing the first and second image into pixels (i.e. the images are digital images, which are divided into pixels).

Regarding claim 5, Moghaddam discloses that only the pixels located in the region are selected (see figure 2(b)).

Regarding claim 6, Krishnamachari discloses assigning an array value as the color value (column 4, lines 33-59: e.g. LUV array value).

Regarding claim 7, Krishnamachari discloses assigning a 3-D array value (i.e. LUV is a 3-D array).

Regarding claim 8, Krishnamachari discloses that utilizing R, G, and B values is conventional (column 1, lines 35-45).

Regarding claim 9, Krishnamachari discloses that the RGB values are typically 24 bits, so that the values of each color range from 0-255 (column 1, lines 35-45).

Regarding claim 10, Krishnamachari discloses combining the R, G, and B values into a smaller number of agglomerate values (column 1, lines 55-64).

Regarding claim 11, Krishnamachari discloses that combining portions of the first and second histogram subdivisions into a first and second series of histogram partitions is

conventional (column 1, lines 47-67: the 24-bit RGB values, representing millions of colors, are quantized into 64 colors so that the millions of histogram subdivisions for each image are combined to form 64 partitions → in other words, portions of the first and second histogram subdivisions (i.e. different groups of the histogram bins) are combined into a series of histogram partitions (i.e. the groups each combine to from one of 64 partitions)).

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of U.S. Patent 4,985,856 by Kaufman et al. ("Kaufman").

Regarding claim 4, Krishnamachari and Moghaddam are silent to selecting the subset based on criteria related to a voxel region of the object.

Kaufman discloses a 3-D image storage and retrieval system. Rather than storing conventional 2-D image data, Kaufman's system is operative to store and retrieve 3-D image data composed of voxels.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Kaufman to select a the subsets based on criteria related to a voxel region, rather than criteria related to a pixel region, since Kaufman discloses that it is desirable to represent images in 3-D with voxels and store and retrieve such images (see column 2, lines 56-66 and column 9, lines 45-52).

11. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of U.S. Patent 6,691,126 by Syeda-Mahmood.

Regarding claim 15, Krishnamachari and Moghaddam are silent to the object including a Lamertian surface.

Syeda-Mahmood discloses an image processing system for locating objects in a video database. In particular, Sydea-Mahmood discloses methods by which Lambertian surfaces are modeled and retrieved in a video database (see column 6, lines 41-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Syeda-Mahmood to choose the object to include a Lambertian surface, since Krishnamachari and Moghaddam disclose that any arbitrary object in an image may be obtained for retrieval purposes, and Syeda-Mahmood shows that it is conventional to retrieve objects that represent Lamertian surfaces.

12. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of "Color Indexing" by Swain et al. ("Swain").

Regarding claim 14, Krishnamachari is silent to comparing corresponding histogram subdivisions, as claimed.

Swain discloses the conventional manner in which histograms are compared. At § 3.1.1, Swain discloses that histograms are compared by comparing corresponding histogram subdivisions via a "min" function to see if each subdivision contains at least one pixel.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Swain to compare histograms as claimed, since Swain shows that comparing corresponding histogram subdivisions to ascertain whether pixels

are present in each of the bins is a conventional technique for effecting a comparison of histograms.

13. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of U.S. Patent 6,711,288 by Kim et al. ("Kim").

Regarding claim 17, neither Krishnamachari nor Moghaddam discloses assigning a uniform region color to the entire region in the object.

Kim discloses a method for designating a local representative color value for image regions in order to facilitate image retrieval. In particular, Kim discloses assigning uniform region colors to each of the image regions based on the local color histogram (see figure 2A, block S52). Then, the local representative color of each region is used to select an optimal searching algorithm.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Kim to assign the region a uniform color since Kim discloses that utilizing local representative colors (i.e. uniform region colors) allows an optimal search algorithm to be automatically ascertained (see column 3, lines 18-25).

Allowable Subject Matter

14. Claims 12, 13, 16, 18, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 12, Krishnamachari does not disclose or suggest that either of the first or second series of histogram partitions partially overlap. Rather, Krishnamachari suggests that the 64 histogram partitions would necessarily be non-overlapping. See also the explanation for claim 11.

Regarding claims 16 and 20, Krishnamachari discloses the obtaining, subdividing, selecting, assigning, placing steps, as pertaining to a second reference image in the image database. Krishnamachari also discloses comparing the third series of histogram subdivisions of the second reference image to the first series of the target image. However, Krishnamachari does not disclose comparing the third series of histogram subdivision of the second reference image to the second series of histogram subdivisions of the first reference image. In Krishnamachari's system, characteristics of the reference images are not compared to each other; they are each exclusively compared to the target image.

Regarding claim 18, neither Krishnamachari nor Moghaddam disclose or suggest deciding whether to use the region based on the number of partitions, as claimed.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colin M. LaRose whose telephone number is (703) 306-3489. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au, can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 2600 Customer Service Office whose telephone number is (703) 306-0377.

CML
Group Art Unit 2623
30 June 2005